CLAIMS

WHAT IS CLAIMED IS:

1. In an optical pointing device for use with a computer system, an optical displacement detection system comprising:

a sensor assembly having an electromagnetic energy sensing module and a control logic module, the electromagnetic energy sensing module configured to scan an imaged area to capture images of a surface; and

a plurality of light sources, each of the plurality of light sources configured to have at least one unique illumination characteristic, the plurality of light sources configured to emit electromagnetic energy to illuminate the imaged area upon selection by the control logic module of the sensor.

2. The optical displacement detection system of claim 1, wherein the at least one unique illumination characteristic includes one of the group consisting of a wavelength, a light homogeneity, an impinging angle, and a light intensity.

3. The optical displacement detection system of claim 1, wherein at least one of the plurality of light sources is an infrared LED.

4. The optical displacement detection system of claim 1, wherein at least two of the plurality of light sources are packaged together in a single package.

5. The optical displacement detection system of claim 4, wherein the at least two of the plurality of light sources are included in a multi-wavelength LED.

6. The optical displacement detection system of claim 1, wherein the plurality of light sources comprise a first light source configured to emit electromagnetic energy at a first impinging angle and a second light source configured to emit electromagnetic energy at a second impinging angle.

7. The optical displacement detection system of claim 6, wherein the first light source is configured to emit electromagnetic energy at the first impinging angle by positioning the first light source at a first angle with respect to the imaged area and wherein the second light source is configured to emit electromagnetic energy at the second impinging angle by positioning the second light source at a second angle with respect to the imaged area.

8. The optical displacement detection system of claim 6, wherein the first light source is configured to emit electromagnetic energy at the first impinging angle by associating the first light source with a first illumination lens configured to fold rays of the electromagnetic energy to the first impinging angle and wherein the second light source is configured to emit electromagnetic energy at the second impinging angle by associating the second light source with a second illumination lens configured to fold rays of the electromagnetic energy to the second impinging angle.

9. The optical displacement detection system of claim 6, wherein the first impinging angle is a low impinging angle of substantially 7 to 10 degrees and the second impinging angle is a high impinging angle of substantially 25 to 45 degrees.

10. The optical displacement detection system of claim 1, wherein the control logic comprises a light selection module coupled to the plurality of light sources, the light selection module configured to select one or more of the plurality of light sources for emiting electromagnetic energy to illuminate the imaged area.

11. The optical displacement detection system of claim 1, wherein the electromagnetic energy sensing module is a light sensor with optimal gain response at infrared wavelengths.

12. The optical displacement detection system of claim 1, wherein the optical pointing device is one of an optical mouse or an optical trackball.

13. An optical pointing device for use in a computer system comprising:

a sensor assembly having a light sensor optically coupled with an imaging lens and electrically coupled with a control logic circuit, the light sensor configured to receive electromagnetic energy from an imaged area of a surface and configured to derive displacement information with respect to the surface by comparing a plurality of images of the surface captured over a period of time; and

an illumination assembly having a plurality of light sources, each light source configured to generate an electromagnetic energy beam to illuminate the imaged area, and each light source associated with at least one unique illumination characteristic.

14. The optical pointing device of claim 13, wherein the illumination characteristics include at least one of the group consisting of a wavelength, a light intensity, a beam homogeneity, and an impinging angle.

15. The optical pointing device of claim 13, wherein the control logic circuit is configured to select one or more light sources from the plurality of light sources for illuminating the imaged area based on a measured performance index associated with the surface.

16. The optical pointing device of claim 14, wherein the control logic circuit includes an output line coupled to a power switch, the power switch configured to turn on a selected one or more light sources of the plurality of light sources as indicated on a selection signal received through the output line from the control logic circuit.

17. The optical pointing device of claim 13, wherein the imaging lens comprises a passive filter.

18. The optical pointing device of claim 13, wherein at least one of the light sources is an infrared LED.

19. The optical pointing device of claim 18, wherein the imaging lens comprises a passive filter configured to filter out non-infrared electromagnetic energy to prevent it from reaching the sensor.

20. The optical pointing device of claim 13, wherein at least two of the plurality of light sources are packaged together in a single package.

21. An optical pointing device for use in a computer system, the optical pointing device comprising:

a sensor assembly having a sensor optically coupled with an imaging lens and electrically coupled with a control logic circuit, the sensor configured to receive electromagnetic energy scattered from an imaged area of a surface and configured to capture a plurality of images over a period of time, the control logic circuit configured to derive pointing device movement data by comparing the plurality of images of the surface captured over a period of time;

an illumination assembly having a first light source configured to illuminate the imaged area; and

a signaling light source positioned within the optical pointing device to prevent interference with an optical path between the illumination assembly and the sensor assembly, the signaling light source configured to be visible to a user.

22. The optical pointing device of claim 21, wherein the illumination assembly further comprises at least a second light source, the second light source having a different illumination characteristic than the first light source.

23. The optical pointing device of claim 22, wherein the control logic circuit includes a light source selection module configured to select one of the first light source or the second light source for generating electromagnetic energy to illuminate the imaged area.

24. The optical pointing device of claim 21, wherein the first light source is an IR LED and the signaling light source is one of a color LED or an organic LED display.

25. The optical pointing device of claim 21, wherein the first light source is an IR LED and the signaling light source is a color LED configured to emit light of a color from the group consisting of red, blue, green, yellow, and white.

26. The optical pointing device of claim 21, wherein the signaling light source is coupled to a light pipe configured to guide light generated at the signaling light source towards the exterior of the optical pointing device, and further configured to prevent interference from the light generated at the signaling light source with the optical path.

27. The optical pointing device of claim 21, further comprising a second signaling light source, the first and second signaling light sources for communicating visual operation status messages to the user.

28. A sensor for use in an optical displacement detection system comprising:

an image capture module configured to capture electromagnetic energy associated with an imaged area to produce a set of images of the imaged area captured over a period of time;

a digital signal processing module, electrically coupled to the image capture module to receive image data, the signal processing module configured to derive displacement information from differences between the images of the imaged area captured over a period of time; and

a light source selection module, coupled to the digital signal processing module and to a switch selection output line, the light source selection module for producing a light source selection signal in response to a performance index measurement.

29. The sensor of claim 28, wherein the image capture module is configured to capture infrared electromagnetic energy.

30 The sensor of claim 28, further comprising a power management module coupled to the light sensor selection module for reducing power consumption of the optical displacement

detection system in response to the digital signal processing module determining no movement from the displacement information.

31. The sensor of claim 28, wherein the image capture module, the digital signal processing module, and the light sensor selection module are packaged in a single chip carrier.

32. The sensor of claim 28, further comprising an imaging lens, the imaging lens coupled with the image capture module and further including a passive optical filter.

33. A method of selecting one or more light sources for illumination of an imaged area in a multi-light-source optical displacement detection system comprising a plurality of light sources, the method comprising:

measuring a first performance index associated with a first light source;

selecting an adequate light source based, at least in part, on the measured first performance index; and

scanning the imaged area with light originating from the selected adequate light source.

34. The method of claim 33, wherein selecting the adequate light source includes comparing the measured performance index with a minimum performance index.

35. The method of claim 33, wherein measuring the performance index includes determining at least one of a reflection intensity, a contrast, or a number of features on a working surface.

36. The method of claim 33, further comprising measuring a second performance index associated with a second light source and wherein selecting includes comparing the first performance index with the second performance index.

37. The method of claim 33, further comprising:

measuring the first performance index in response to the occurrence of a predetermined event;

determining a variation in the first performance index;

selecting an alternate adequate light source having an associated higher performance index than a last measured first performance index in response to the variation of the first performance index exceeding a maximum variation; and

scanning the imaged area with light originating from the selected alternate adequate light source.

38. The method of claim 37, wherein the predetermined event includes at least one of the group consisting of a passing of a time period, a lift detection, and a scan data processing error.

39. The method of claim 33, further comprising:

measuring the first performance index in response to the occurrence of a predetemined event;

determining a variation in the first performance index that exceeds a maximum variation value;

measuring a set of performance indexes associated with each of the light sources of the plurality of light sources and further associated with a combination of sets of light sources;

selecting an alternate adequate set of light sources having a highest associated performance index amongst the set of performance indexes; and

scanning the imaged area with light originating from the selected alternate adequate set of light sources.

40. A method of selecting one or more light sources for illumination of an imaged area in a multi-light-source optical displacement detection system comprising a plurality of light sources, the method comprising:

turning on a first light source;

measuring a first performance index associated with the first light source;

switching to a second light source;

measuring a second performance index associated with the second light source;

comparing the first performance index with the second performance index to determine a best performance index;

determining a best light source associated with the highest performance index;

selecting the best light source for illuminating during scanning of the imaged area.

41. A light source selection module for selecting one or more light sources for illumination of an imaged area scanned by a multi-light-source optical displacement detection system comprising a plurality of light sources, the light source selection module comprising:

means for measuring a first performance index associated with a first light source;

means for selecting an adequate light source based, at least in part, on the first performance index; and

means for scanning the imaged area with light originating from the selected adequate light source.